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Restaurant Market Analysis

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Abstract - *A wise planning of investment is very essential before establishing a new restaurant. There are many factors that influence the success rate of a restaurant. Hence, a thorough analysis some of those major factors is required for determining the probable rate of success of the restaurant. One of these factors is location, which plays a vital role in the determining the success of a restaurant. This paper studies various attributes of existing restaurants and analyses them to predict an appropriate location for higher success rate of the new restaurant. The study of existing restaurants in a particular location and the growth rate of that location is important prior to selection of the optimal location. The aim is to the create a web application that determines the location suitable to establish a new restaurant unit, using machine learning and data mining techniques.*

Key Words: **restaurant market, location determination, predictive analysis, existing market conditions, customer satisfaction, regression algorithm**

1. INTRODUCTION

A new venture requires strategy and planning before making investment as well as a thorough analysis of existing market conditions. At present, restaurant business is one of the most profitable businesses, but also involves immense risk. Newly set up restaurants require large capital investment and operational costs. In [1] the author states that, when the new outlet fails to break even, it closes in a short span of time, thereby incurring huge losses.

Location of the new venture plays an important role in determining whether it will be successful. Emerging trends in the restaurant market also play a vital role while designing the business plan. It is imperative for restaurateurs to understand the likes and dislikes of the customers [3]. Since, location is an important factor in determining success, a thorough analysis of the location needs to be performed before the investment is made. When an investor wants to open a new restaurant in a city, he/she is unsure of the area in the city to invest in. Opportunities for new restaurants in various regions can be established based on the information about already existing restaurants in the region.

To solve the above stated problem the proposed system intends to explore factors that determine the success rate of a restaurant by creating an application that accepts various attributes of the new venture as an input, analyses them against various attributes of gathered existing restaurants in an already created data set, and provides the investor with a location that may be suitable for his/her venture. We aim to design an automated system to determine location suitable for the establishment of a restaurant business by applying concepts of Random Forest regression algorithm. The primary objective of the proposed system is to help investors make an informed and optimal decision about selecting a location for their restaurant business before opening a new outlet in the city, which would help investors take calculated risk.

2. RELATED WORK

This section summarizes the existing works by various researchers' for setting-up and running a successful restaurant. There are many factors that determine the success of a restaurant and location is deemed to be the most significant factor among them. It is important that the restaurant is in the vicinity of that community, which has sufficient count of the ideal customers that the restaurant targets. Here, we focus on only those contributions that consider location as a major factor for analysis.[6]

According to [3], people rate a restaurant not only based on food but also on dine-scape factors such as facility aesthetics, lighting, ambience, layout, table setting and servicing staff. With the abundance of data available on the above factors, analysis on it can be done using various mathematical models and data analysis methods like multiple Regression, Neural Networks, Bayesian network model, Random forest, SVM and many more can be used in predicting potential revenue of restaurant depending on various factors [1], [4]. Not only revenue prediction but also customer preference can be determined. Analysis provides more insights to the restaurateurs and can be used as reference for decision making.[6] Many online articles[5] can be found to facilitate restaurateurs in considering important factors such as industry trends, location market area, competition, customer psychological and potential revenue projection by providing questionnaires and survey forms. It can be difficult for a restaurateur to understand these factors and it also time consuming.

3. PROPOSED SYSTEM

Considering the Indian scenario, the GDP has grown at a fast pace in the last few years and accordingly the lifestyle of people has also changed. This transformation is visible with

more and more people eating out frequently. Restaurants are cropping up in every corner of the city to meet this increased demand. In order for restaurants to survive in this highly competitive business, location plays a vital role. The other factors include capital investment, operational costs, cuisines provided and so on. Location of a new venture plays an important role in determining its success.[6]

We have proposed a system which provides the investor, a suitable location for investment within the city, determined from the information gathered about existing restaurants, like type of food, average cost for two, cuisines, alcohol availability, etc. The system determines the locations that possess the threshold characteristics required for a successful restaurant. Initially, data related to location, cuisines, alcohol availability, ratings, etc., about existing restaurants is collected from online sources. It is stored in the database and used for the market analysis. The system provides location prediction based on the feature set including the type of cuisine. The Random Forest Regression algorithm is used for the prediction of suitable location for a new restaurant based on the feature set that governs the profit of any food junction. The collected data set has been divided in a ratio of 7:3 as the training set and testing set.

Latitude	Longitude	Avg. cost for two	Online rating	Veg/ Non-veg Availability	Alcohol availability	Cuisines

Table -1: Dataset (Input data for Random Forest Regression for the prediction of suitable location)

4. RESULTS

The existing market conditions play an important role in analysing the success of any venture at any location. Taking into consideration, parameters like the existing cuisine in the location, competition, demographic preferences, etc. an analysis of the market provides a good understanding of whether a restaurant will break even and make profit in the desired location. The algorithm for location prediction provides results and accuracy rates as mentioned below.

The result of the regression algorithm used can be seen in the plot [Fig. 1]. The red circles indicate the predicted values for the test set while the blue squares indicate the actual locations of the restaurants in the collected set. The algorithm achieved a mean accuracy of 99.8% while the mean squared error is approx. 0.081.[Fig. 2] Using this algorithm, an investor can get a suitable location prediction for the new venture.

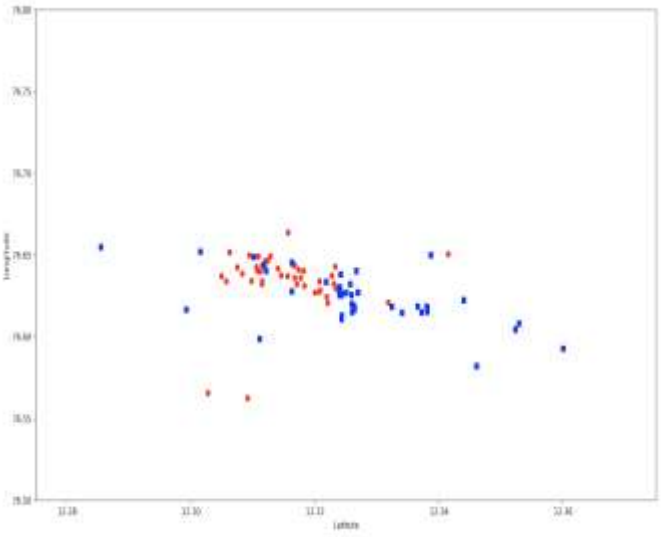

Figure -1: Plot of Random Forest Regression(red) vs Actual data(blue)

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[12.31115866 76.64028244]
[12.31766281 76.63621731]
[12.33179458 76.62099533]
[12.31190805 76.644133  ]
[12.32206116 76.62086945]
[12.3145289  76.63758266]
[12.31561604 76.66379166]
[12.32114096 76.63274231]]
Mean Squared Error for Random Forest Regressor:
0.08179986225565093
Mean Accuracy: 99.8 %.
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Figure -2: Obtained accuracy for Random Forest model

5. CONCLUSIONS

This paper studies a number of features about existing restaurants of different areas in a city and analyses them to predict appropriate location for better success of the new restaurant. This makes it an important aspect to be considered, before making a large investment in a new venture at an unknown place.

Such analysis is essential part of planning before establishing a venture like that of a restaurant. Lot of researches have been made on factors which affect sales and market in restaurant industry. Various dine-scape factors have been analysed to improve customer satisfaction levels. Based on these studies, our proposed system aims at creating a web application which recommends the best suitable location for setting up a new restaurant, with a calculated accuracy rate of over 99%, thereby reducing the task of analysing each individual factor, for the investor. Thus, it provides a platform to the user which helps in choosing a location for establishing the new restaurant.

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